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Supporting Information

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From Chemical Gardens to Fuel Cells: Generation of Electrical Potential and Current Across Self-Assembling Iron Mineral Membranes**

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Supporting Information:

Acidic Solution	Alkaline Solution	Experiment Type	Duration	Max Current (mA)	Max Voltage (V)
0.02 M $FeCl_2$	0.02 M Na_2S	Chemical Garden	3.5 hours	0.005	0.98
0.005 M $FeCl_2$ + 0.015 M $FeCl_3$	0.02 M Na_2S	Chemical Garden	3.5 hours	----------	0.93
0.005 M $FeCl_2$ + 0.015 M $FeCl_3$	0.1 M NaOH	Chemical Garden	3.5 hours	----------	0.51
0.075 M $FeCl_2$ + 0.025 M $FeCl_3$	0.1 M NaOH	Chemical Garden	3 hours	0.02	0.45
0.025 M $FeCl_2$ + 0.075 M $FeCl_3$	0.1 M NaOH	Chemical Garden	3 hours	0.013	0.15
0.075 M $FeCl_2$ + 0.025 M $FeCl_3$	0.1 M NaOH + 0.05 M Na_2S	Chemical Garden	3 hours	0.9	0.98
0.025 M $FeCl_2$ + 0.075 M $FeCl_3$	0.1 M NaOH + 0.05 M Na_2S	Chemical Garden	3 hours	1.4	1.07
0.075 M $FeCl_2$ + 0.025 M $FeCl_3$ + 0.02 M $NaNO_2$	0.1 M NaOH + 0.05 M Na_2S + 0.02 M CH_3OH	Chemical Garden	3 hours	1.2	1.11
0.025 M $FeCl_2$ + 0.075 M $FeCl_3$ + 0.02 M $NaNO_2$	0.1 M NaOH + 0.05 M Na_2S + 0.02 M CH_3OH	Chemical Garden	3.5 hours	0.7	0.99
0.075 M $FeCl_2$ + 0.025 M $FeCl_3$ + 0.02 M $NaNO_3$	0.1 M NaOH + 0.05 M Na_2S + 0.02 M CH_3OH	Chemical Garden	3 hours	0.6	0.96
0.075 M $FeCl_3$ + 0.025 M $FeCl_2$ + 0.02 M $NaNO_2$	0.1 M NaOH + 0.05 M Na_2S + 0.02 M CH_3OH	3 CG in series	3.5 hours	0.7	2.4
0.02 M $FeCl_2$	0.02 M Na_2S	4 CG in series	3.5 hours	0.005	1.5
0.075 M $FeCl_2$ + 0.025 M $FeCl_3$	0.1 M NaOH + 0.05 M Na_2S	4 CG in series	3 hours	0.4	3.9
0.025 M $FeCl_2$ + 0.075 M $FeCl_3$	0.1 M NaOH + 0.05 M Na_2S	4 CG in series	3 hours	1.1	4.3
0.075 M $FeCl_2$ + 0.025 M $FeCl_3$ + 0.02 M $NaNO_3$	0.1 M NaOH + 0.05 M Na_2S + 0.02 M CH_3OH	4 CG in series	3 hours	0.7	3.6
0.025 M $FeCl_2$ + 0.075 M $FeCl_3$ + 0.02 M $NaNO_3$	0.1 M NaOH + 0.05 M Na_2S + 0.02 M CH_3OH	4 CG in series	3.5 hours	0.8	3.5
0.02 M $FeCl_2$ + 0.005 M $NaNO_3$	0.1 M NaOH + 0.005 M CH_3OH	4 CG in series	3.5 hours	0.002	0.7
0.075 M $FeCl_2$ + 0.025 M $FeCl_3$ + 0.02 M $NaNO_3$	0.1 M NaOH + 0.02 M CH_3OH	4 CG in series	3 hours	0.012	1.0
0.025 M $FeCl_2$ + 0.075 M $FeCl_3$ + 0.02 M $NaNO_3$	0.1 M NaOH + 0.02 M CH_3OH	4 CG in series	3.5 hours	----------	1.3
0.02 M $FeCl_2$	0.02 M Na_2S	Fuel Cell	68 hours	----------	0.67
0.075 M $FeCl_2$ + 0.025 M $FeCl_3$	0.1 M NaOH	Fuel Cell	23 hours	----------	0.98
0.075 M $FeCl_2$ + 0.025 M $FeCl_3$	0.1 M NaOH	Fuel Cell	68 hours	----------	0.86
0.025 M $FeCl_2$ + 0.075 M $FeCl_3$	0.1 M NaOH	Fuel Cell	68 hours	----------	0.77
0.075 M $FeCl_2$ + 0.025 M $FeCl_3$ + 0.01 M $NaNO_3$	0.1 M NaOH + 0.02 M Na_2S + 0.01 M CH_3OH	Fuel Cell	68 hours	----------	0.69
0.025 M $FeCl_2$ + 0.075 M $FeCl_3$ + 0.02 M $NaNO_3$	0.1 M NaOH + 0.05 M Na_2S + 0.02 M CH_3OH	4 FC in series	3 hours	1.2	4.1

Table 1. Chemical Garden (CG) and Fuel Cell (FC) experiments. In chemical garden experiments, the alkaline solution was injected into the acidic solution at 2 mL / hour. In fuel cell experiments, the acidic and alkaline solutions were interfaced across a dialysis membrane. In CG and FC experiments, the potential was measured throughout and the current was measured periodically.

In all experiments, the potential and current decreased gradually as the experiment progressed toward equilibrium, and the maximum values of each are recorded here.